

Appl. No. 09/874,666
Amdt. Dated 10/04/2004
Reply to Office Action of 07/06/2004

REMARKS/ARGUMENTS

Claims 7-14 and 31-35 remain in this application.

In the final Office Action dated July 6, 2004, the Examiner objected to the drawings and the specification and rejected (i) claims 7-14 and 31-35 under 35 U.S.C. § 112, (ii) claims 7, 8 and 10-14 and 31-35 under 35 U.S.C. § 102, and (iii) claims 7, 8, 10-14 and 31-35 under 35 U.S.C. §103. Claim 35 has been amended to correct minor informalities. Reconsideration in light of the amendments and remarks made herein is respectfully requested.

Objection to Drawings

In the final Office Action, the Examiner states that the drawings do not show every feature of the invention specified in the claims. Applicants respectfully disagree. As argued in the response filed April 21, 2004, the drawings show all the necessary features in the claims. For example, Figure 3 shows the first underfill material 24 as recited in claims 7, 11 and 31 ("dispensing the first material acting as underfill"), the second underfill material 26 as recited in claims 7, 11 ("dispensing a second material to form a circumferential fillet"), and 31 ("dispensing a second material only around a periphery ... to form a circumferential fillet"). Figure 4 shows (1) the substrate 12 initially baked as recited in claims 11 and 31 ("heating the substrate"), (2) dispensing the first underfill material 24 as recited in claims 1, 11 and 31 above; and (3) dispensing the second underfill material 26 as recited in claims 1, 11 and 31 above.

Accordingly, Applicants respectfully request the objection to the drawings be withdrawn.

Specification

In the final Office Action, the Examiner objects to the specification as being insufficient because proper identification of the product sold under the trademarks SEMICOAT 5230-JP and SEMICOAT 122X is omitted from the specification and such identification is deemed necessary (final Office Action, page 4). The Examiner further states that identification of these alleged properties by scientific or other necessary explanatory language is not provided (final Office Action, page 4). Applicants respectfully disagree. As argued in the response filed April 21, 2004, such identification is not required. First, the product identification of Semiccoat 5230-JP and Semiccoat 112X is complete as described in the Specification (see Specification, page 8, lines

Appl. No. 09/874,666
Amdt. Dated 10/04/2004
Reply to Office Action of 07/06/2004

19-25; page 9, lines 1-2). Second, the use of these products are merely for illustrative purposes, and not necessary for the principles of the invention.

In the final Office Action, the Examiner states that Applicant's allegation is deemed unpersuasive because Applicants merely cite without elucidation, and the citations do not otherwise appear to support the allegation. Applicants respectfully disagree.

Applicants are re-submitting the supporting evidence in the Appendix to refute the Examiner's statement that there is no art recognizing the definition of the material properties "adhesive" and "adhesion". Applicants contend that the adhesive property in underfill material is well known in the art. The Appendix contains evidence to show this. For example, sheet A1 of the Appendix contains a description title "liquid epoxy encapsulating materials". The description states:

This is a liquid epoxy resin encapsulating material for the production and adhesion of semiconductor devices.

Features: Excellent low stress, adhesive, and penetration property.

Applications: Under filling, COB potting, hermetic seal, and other uses for electrical or mechanical protection and highly reliable adhesion of semiconductor devices.

The above description indicates that adhesive property in underfill material is well known in the art.

Accordingly, Applicants respectfully request the objection to the specification be withdrawn.

Rejection Under 35 U.S.C. § 112

1. The 35 U.S.C. §112 rejection, first paragraph, of claims 7-14 and 31-35 for insufficient written description.

In the final Office Action, the Examiner states that the undescribed subject matter of the claimed invention is the limitation recited in claims 7 and 11, ("the second material being different than the first material and having a lower adhesive property than the first material") and

Appl. No. 09/874,666
Amdt. Dated 10/04/2004
Reply to Office Action of 07/06/2004

the limitation recited in claim 32 ("the second material being different than the first material and having a lower adhesion property than the first material").

The Examiner states that "the instant application does not describe sufficient description of a representative number of species by actual reduction to practice, reduction to drawings, or by disclosure of relevant, identifying characteristics, i.e., structure or other physical and/or chemical properties, by functional characteristics coupled with a known or disclosed correlation between function and structure, or by a combination of such identifying characteristics, sufficient to show the applicant was in possession of the claimed genus" (final Office Action, page 6). Applicants respectfully disagree for the following reasons.

The limitation "the second material being different than the first material and having a lower adhesive property than the first material" is supported in the specification on page 8 (lines 19-25) and page 9 (lines 1-2). Specifically, the specification states:

"The first underfill material 24 may be an epoxy produced by Shin-[E]tsu of Japan under the product designation Semicoat 5230-JP... The second underfill material 25 may be an anhydride epoxy produced by Shin-[E]tsu under the product designation Semicoat 122X. The Semicoat 122X material has lower adhesion properties than the Semicoat 5230-JP material, but much better fracture/crack resistance" (Specification, page 8, lines 19-25, and page 9, lines 1-2).

An Applicant may also show that an invention is complete by disclosure of sufficiently detailed, relevant identifying characteristics which provide evidence that Applicant was in possession of the claimed invention, i.e., complete or partial structure, other physical and/or chemical properties, functional characteristics when coupled with a known or disclosed correlation between function and structure, or some combination of such characteristics. Enzo Biochem, 323 F.3d at 964, 63 USPQ2d at 1613.

Here, the specification, as recited above, discloses the functional characteristics ("lower adhesion properties") when coupled with a known or disclosed correlation between function and structure, or some combination of such characteristics ("SEMICOAT 122X", "SEMICOAT

Appl. No. 09/874,666
Amdt. Dated 10/04/2004
Reply to Office Action of 07/06/2004

5230-JP"). Therefore, the disclosure is complete to satisfy the written description with request to the subject matter claimed in claims 7 and 11.

In addition, the Examiner has the initial burden of presenting by a preponderance of evidence why a person skilled in the art would not recognize in an applicant's disclosure a description of the invention defined by the claims. In re Werthen, 541 F.2d 257, 263, 191 USPQ 90, 96 (CCPA 1976). Applicants contend that the Examiner has not met this burden because the Examiner has not presented by a preponderance of evidence why a person skilled in the art of semiconductor would not recognize the description that "the Semicoat 122X material has lower adhesion properties than the Semicoat 5230-JP material". Furthermore, a general allegation of "unpredictability in the art" is not a sufficient reason to support a rejection for lack of adequate written description." MPEP 2163.04I.

2. The 35 U.S.C. §112 rejection, first paragraph, of claims 7-14 and 31-35 for lack of enablement.

The Examiner contends that claims 7-14 and 31-35, while being enabling for the disclosed species wherein the first material is SEMICOAT 5230-JP and the second material is SEMICOAT 122X, does not reasonably provide enablement for the limitations recited by claims 7, 11, and 32 above (final Office Action, page 6, 7). The Examiner further states that "there is no disclosure that the claimed properties and functions define a particular film composition genus", and "the invention involves unpredictable chemical reactions, and absent a statement applicable to the genus as a whole, it is indeterminable from the disclosure of the particular species what other species will work; hence, it is indeterminable what other species are members of the genus" (final Office Action, page 7). The Examiner then concludes that "[c]hemical reactivity is a most unpredictable and empirical art and it is well settled that the requirement that the claims be commensurate in scope with the enabling disclosure is particularly stringent in this area of technology", citing In re Doumani 126 USPQ 408 (CCPA 1960), In re Grant, 134 USPQ 248 (CCPA 1962), In re Fisher, 166 USPQ 18 (CCPA 1970), Mobil Oil Corporation v. W.R. Grace and Company 180 USPQ 418 (Dist. Ct. P. Connecticut, 1973), Corona Cord Tire Company v. Doan Chemical Corporation, 192 CD 255, and In re Hawkins 174 USPQ 157.

Applicants respectfully disagree with the Examiner's contention. First, the Examiner mis-applies the enablement requirement of 35 U.S.C. §112, first paragraph. To comply with 35

Appl. No. 09/874,666
Amdt. Dated 10/04/2004
Reply to Office Action of 07/06/2004

U.S.C. §112, first paragraph, it is not necessary to “enable one of ordinary skill in the art to make and use a perfected, commercially viable embodiment absent a claim limitation to that effect.” CFMT, Inc. v. Yielding Int’l Corp., 349 F.3d 1333, 1338, 68 USPQ 2d 1940, 1944 (Fed. Cir. 2003). The standard for determining whether the specification meets the enablement requirement was first provided in the Supreme Court decision of Mineral Separation V. Hyde, 242 U.S. 261, 270 (1916). The statute has been interpreted to require that the claimed invention be enabled so that any person skilled in the art can make and use the invention without undue experimentation. In re Wands, 858 F.2d at 737, 8 USPQ2d at 1404 (Fed. Cir. 1988). A patent need not teach, and preferably omits, what is well known in the art. In re Buchner, 929 F.2d 660, 661, 18 USPQ2d 1331, 1332 (Fed. Cir. 1991); Hybritech, Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1384, 231 USPQ 81 94 (Fed. Cir. 1986), cert. denied, 480 U.S. 947 (1987); and Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co., 730 F.2d 1452, 1463, 221 USPQ 481, 489 (Fed. Cir. 1984). The test of enablement is not whether any experimentation is necessary, but whether, if experimentation is necessary, it is undue. In re Angstadt, 537 F.2d 498, 504, 190 USPQ 214, 219 (CCPA 1976). MPEP page 2100-185.

Here, the Examiner merely asserts that there is no disclosure that the claimed properties and functions define a particular film composition genus (Applicant assume that the phrase “film composition” is a typographical error). The Examiner’s assertion is not supported by a showing that if an experimentation is necessary, it is undue. The Examiner merely asserts that the invention involves unpredictable chemical reactions, and absent a statement applicable to the genus as a whole, it is indeterminable from the disclosure of the particular species what other species will work. This assertion is flawed for at least two reasons. First, the invention does not involve unpredictable chemical reactions. The adhesive property of the underfill material is well known and not a chemical reaction. This adhesive property is predictable and ascertainable by the identification of the products that have the adhesive property, namely, Semicoat 122X and Semiccoat 530-JP. Second, there is no issue of genus and species between what is disclosed and what is claimed. The claim recites “lower adhesive property” and the specification discloses “lower adhesive property”. The specification further provides the product names Semiccoat 122X and Semiccoat 5230-JP as illustrative examples of lower adhesive property.

Appl. No. 09/874,666
Amdt. Dated 10/04/2004
Reply to Office Action of 07/06/2004

In order to make a rejection, the Examiner has the initial burden to establish a reasonable basis to question the enablement provided for the claimed invention. In re Wright, 999 F.2d 1557, 1562, 27 USPQ 2d 1510, 1513 (Fed. Cir. 1993); MPEP 2164.04. Applicants contend that the Examiner has not met this burden.

“[I]t is incumbent upon the Patent Office, whenever a rejection on this basis is made, to explain why it doubts the truth or accuracy of any statement in a supporting disclosure and to back up assertions of its own with acceptable evidence or reasoning which is inconsistent with the contested statement. Otherwise, there would be no need for the Applicant to go to the trouble and expense of supporting his presumptively accurate disclosure.” In re Marzocchi, 439 F.2d at 224, 169 USPQ at 370. MPEP 2164.04.

Here, the Examiner did not explain why it doubts the truth or accuracy of the statement “[t]he Semicoat 122X material has lower adhesion properties than the Semicoat 5230-JP material” as provided in the specification. Furthermore, the Examiner did not back up assertions of his own with acceptable evidence or reasoning which is inconsistent with the contested statement. The Examiner merely asserts that chemical reactivity is a most unpredictable and empirical art and it is well settled that the requirement that the claims be commensurate in scope with the enabling disclosure is particularly stringent in this area of technology. This statement is flawed in many aspects. First, the adhesive property is not a chemical reactivity. The claims do not recite how to create adhesive property of the underfill material. The claims recite to use underfill material that has a lower adhesive property. Second, there is no unpredictability in selecting an underfill material having a lower adhesive property than another underfill material. In fact, the specification even provides the specific products that have these adhesive properties, namely, the Semicoat 122X and the Semicoat 5230-JP.

The Examiner then cites a series of court cases to support his contention. However, these court cases are not applicable to the issue of whether the disclosure in the specification meets the enablement requirements. These cases merely support the observation that catalytic effects are not ordinarily predictable with certainty as discussed below.

In In re Douman, the court faces with the issue of whether rhodium and platinum are so close to each other that is obvious to substitute one for the other as a catalyst. The Court states that “[a]s pointed out by appellants, catalytic effects are not ordinarily predictable with certainty.

Appl. No. 09/874,666
Amdt. Dated 10/04/2004
Reply to Office Action of 07/06/2004

However, the known similarity between two materials may be such that when one of them is found to be a suitable catalyst for certain purposes it will suggest the probability that the other will also be suitable. *Id.* at 410. The Court, therefore, merely repeats what the appellant pointed out that catalytic effects are not ordinarily predictable with certainty.

In *In re Fisher*, one issue presented to the Court was whether a claim is so broad that the specification lacks sufficient support description to comply with the requirements of 35 U.S.C. §112, first paragraph. The Court states that “[i]n cases involving unpredictable factors, such as most chemical reactions and physiological activity, the scope of enablement obviously varies inversely with the degree of unpredictability of the factors involved.” *Id.* at 24.

In *In re Mercier*, one issue facing the court is whether it would have been obvious to substitute acetals or hemi-acetals as reactants for the esters of the prior art reference. The Court states that “[t]he unpredictability of the catalytic phenomenon has long been recognized by this court.” *Id.* at 779. The Court further states that “[t]he adequacy of any such showing if equivalency must be scrutinized especially carefully, where it is alleged to have been obvious to substitute one starting material for another in a catalytic process. *Id.* at 780.

In *In re Slocombe*, the Court states that “catalytic effects are a particular unpredictable aspect of the art of chemistry”. *Id.* at 744, citing *In re Doumani*, 281 F.2d 215, 126 USPQ 408 (1960).

In *Mobile Oil*, the Court states that “this Court is not unmindful that where intricate questions of chemistry are involved,..., the presumption of validity should be weighed with great care. This is especially true where catalysts are involved, because of their known unpredictability under modified changes in their environmental use.” *Id.* at 430.

In *In re Grant*, the Court ruled that the Applicant is not entitled to have broad claims where the specification does not have broad statement or suggestion that all types of sequestering agents complexed with irons are suitable as a catalytic. The Court states that since catalytic behavior is generally recognized as being predictable, it does not agree to the generic nature of the disclosure regarding sequestered iron compounds. *Id.* at 250.

Since these cases merely recognize the unpredictability of catalytic phenomenon, they are inapplicable to the issue of enablement because selecting an underfill material to have lower adhesive properties than another underfill material is not related to catalytic phenomena.

Appl. No. 09/874,666
Amdt. Dated 10/04/2004
Reply to Office Action of 07/06/2004.

3. The 35 U.S.C. §112 rejection, second paragraph, as being indefinite.

In the final Office Action, the Examiner states that in claim 7 and 11, the scope of the limitation "adhesive property," and in claim 31, the scope of the limitation "adhesion property" is indeterminable because there is no art recognized definition of material properties adhesive and adhesion, and these properties are not otherwise explicitly defined in the disclosure (final Office Action, page 8).

However, as argued in the previous response filed April 21, 2004, the adhesive property is a common property of material used in encapsulating by semiconductor devices. Applicants have made an effort to provide the Examiner a product description of a material in Appendix B in the previous response to show that adhesive property is a common property. The Examiner further states that there is no art recognized quantifiable material properties adhesive and adhesion, and a quantification of these properties is not otherwise disclosed. Applicants respectfully disagree. A quantification of these properties is not required to satisfy the 35 U.S.C. §112, second paragraph. The primary purpose of this requirement of definiteness of claim language is to ensure that the scope of the claims is clear so the public is informed of the boundaries of what constitutes infringement of the patent. MPEP 2173. Here, the limitation "the second material being different than the first material and having a lower adhesive property than the first material" clearly defines the boundaries of what constitutes infringement of the patent. There is no requirement that a property of a material has to be quantified for definiteness. The Examiner has not offered authority either in the MPEP or case laws to support his assertion. Furthermore, what is claimed is not the specific values of adhesion. Rather, what is claimed is the relative adhesion between the first and second materials. The relative adhesion is a qualitative characteristic, not a quantitative one.

4. The scope of the limitation "temperature ranting" in claim 35 is unclear.

The term "ranting" is merely a typographical error. Applicants have amended claim 35 to correct this minor informality.

Appl. No. 09/874,666
Amdt. Dated 10/04/2004
Reply to Office Action of 07/06/2004

Rejection Under 35 U.S.C. § 102

In the final Office Action, the Examiner rejected claims 7, 8, 10-14, and 31-35 under 35 U.S.C. § 102(b) as being anticipated by Ameen (0340492) ("Ameen"). Applicant respectfully traverses the rejection and contends that the Examiner has not met the burden of establishing a *prima facie* case of anticipation.

Ameen discloses conformal sealing and interplanar encapsulation of electronic device structures. In Ameen, the overcoat material and the undercoat material are of the same type. They are both formed from a solventless liquid polymer (Ameen, col. 3, lines 10-13; lines 25-28). In the present invention, the second underfill material is different than the first underfill material. As stated on page 6 of the Specification, the second underfill material has lower adhesion properties but much better fracture/crack resistance than those of the first underfill material.

In the final Office Action, the Examiner states that in the frame of reference wherein the integrated circuit is below the substrate, the second material has a positionally lower adhesive and adhesion property of a material is not a function of the relative position between the two materials, or between the integrated circuit and the substrate.

Accordingly, Applicants respectfully request that the Examiner withdraw the rejection of claims 7, 8 and 10 under 35 U.S.C. § 102(e) and claims 7, 8, 10-14 and 31-35 under 35 U.S.C. § 102(b).

Rejection Under 35 U.S.C. § 103

1. The Examiner rejects claims 7, 8, 10-14 and 31-35 under 35 U.S.C. § 103(a) as being unpatentable over Ameen as applied to the rejection above. Applicants respectfully traverse the rejection and contend that the Examiner has not met the burden of establishing a *prima facie* case of obviousness.

Ameen does not disclose, suggest or render obvious (1) dispensing a first material to form an underfill which becomes attached to the integrated circuit and the substrate, (2) dispensing a second material to form a circumferential fillet, the second material being different than the first material and having a lower adhesive property than the first material, and (3) wherein the substrate moves within an oven while the first material flows between the integrated circuit and the substrate.

Appl. No. 09/874,666
Amdt. Dated 10/04/2004
Reply to Office Action of 07/06/2004

The Examiner states that Ameen discloses that adhesive and adhesion properties are result-effective variable, and it would have been an obvious matter of design choice (final Office Action, pages 13-14). Applicants respectfully disagree.

First, the Examiner failed to offer evidence in Ameen to support the contention that adhesive properties are result-effective variables and it would have been an obvious matter of design choice to select a second material having lower adhesive property than the first material. Second, since the Examiner failed to offer evidence with specific columns and line numbers to support the contention, such a conclusion can only come from reliance on common knowledge or taking official notice. However, official notice unsupported by documentary evidence should only be taken by the Examiner where the facts asserted to be well-known, or to be common in the art are capable of instant and unquestionable demonstration as being well-known. MPEP 2144.03, In re Albert, 424 F.2d 1088, 1091, 165 USPQ 418, 420 (CCPA 1970). Here, the Examiner failed to establish that a second material having lower adhesive property than the first material in the context of underfilling an integrated circuit is capable of instant and unquestionable demonstration as being well-known. Furthermore, if official notice is taken of a fact, unsupported by documentary evidence, the technical line of reasoning underlying a decision to take such notice must be clear and unmistakable. MPEP 2144.03. Here, the Examiner's line of reasoning is ambiguous and mistaken. As discussed above, Ameen does not disclose adhesive property is result-effective variable. Even if it is disclosed, it is unclear why this can lead to the second material having lower adhesive property than the first material.

2. The Examiner further rejected claims 7, 8, 10-14, and 31-35 under 35 U.S.C. 103(a) as being unpatentable over Ameen and in combination with Applicant's admitted prior art (AAPA). Applicants respectfully disagree and contend that the Examiner has not met the burden of establishing a *prima facie* case of obviousness. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP §2143, p. 2100-129 (8th Ed., rev. 2, May 2004).

Appl. No. 09/874,666
Amdt. Dated 10/04/2004
Reply to Office Action of 07/06/2004

Applicants respectfully contend that there is no suggestion or motivation to combine their teachings and that no *prima facie* case of obviousness has been established.

Ameen and AAPA, taken alone or in combination, does not disclose, suggest, or render obvious (1) dispensing a first material to form an underfill which becomes attached to the integrated circuit and the substrate, and (2) dispensing a second material to form a circumferential fillet, the second material being different than the first material and having a lower adhesive property than the first material.

Ameen does not disclose any of the above elements as discussed above. AAPA merely discloses two types of materials, SEMICOAT 5230JP and SEMICOAT 122X. AAPA does not disclose, suggest or render obvious using these two materials as an underfill and a circumferential fillet.

3. In the final Office Action, the Examiner rejected claim 9 under 35 U.S.C. 103(a) as being unpatentable over Ameen or the combination of Ameen and Applicant's admitted prior art ("AAPA") as applied to claim 8, supra, and further in combination with U.S Patent Application No. 6,166,434 issued to Desai ("Desai") and U.S Patent Application No. 6,020,579 issued to Lewis ("Lewis").

Desai discloses a die clip assembly for semiconductor package. An underfill material is dispensed into the remaining space (or "gap") between the die and the substrate (Desai, col. 1, lines 65-67; col. 2, lines 1-5).

Lewis discloses a microwave applicator having a mechanical means for tuning. An applicator includes a conveyor belt passing through center openings. Such a system may be utilized to cure or dry coat solder masks, to die attach adhesives or to underfill (Lewis, col. 8, lines 12-21).

Ameen, AAPA, Desai, and Lewis, taken alone or in any combination, do not disclose, suggest, or render obvious (1) dispensing a first material to form an underfill which becomes attached to the integrated circuit and the substrate, (2) dispensing a second material to form a circumferential fillet, the second material being different than the first material and having a lower adhesive property than the first material, and (3) wherein the substrate moves within an oven while the first material flows between the integrated circuit and the substrate.

Appl. No. 09/874,666
Amdt. Dated 10/04/2004
Reply to Office Action of 07/06/2004

None of them discloses (1) and (2) as discussed above. Desai merely disclose the underfill material being dispensed between the die and substrate, not the substrate moving within an oven. Lewis merely discloses a system cure soldermask or to attach adhesives, or to underfill, not the substrate moving within an oven.

Accordingly, Applicants respectfully request that the Examiner withdraw the rejection of claims 7, 8, 9-14, and 31-35 under 35 U.S.C. § 103(a).

Appl. No. 09/874,666
Amdt. Dated 10/04/2004
Reply to Office Action of 07/06/2004

Conclusion

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP.

Dated: October 5, 2004

By



Thinh V. Nguyen

Reg. No. 42,034

Tel.: (714) 557-3800 (Pacific Coast)

12400 Wilshire Boulevard, Seventh Floor
Los Angeles, California 90025

CERTIFICATE OF MAILING/TRANSMISSION (37 CFR 1.8A)

I hereby certify that this correspondence is, on the date shown below, being:

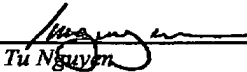
MAILING

☐ deposited with the United States Postal Service
as first class mail in an envelope addressed to:
Commissioner for Patents, PO Box 1450,
Alexandria, VA 22313-1450.

Date: October 5, 2004

FACSIMILE

☒ transmitted by facsimile to the Patent and
Trademark Office.


Tu Nguyen

October 5, 2004

Date